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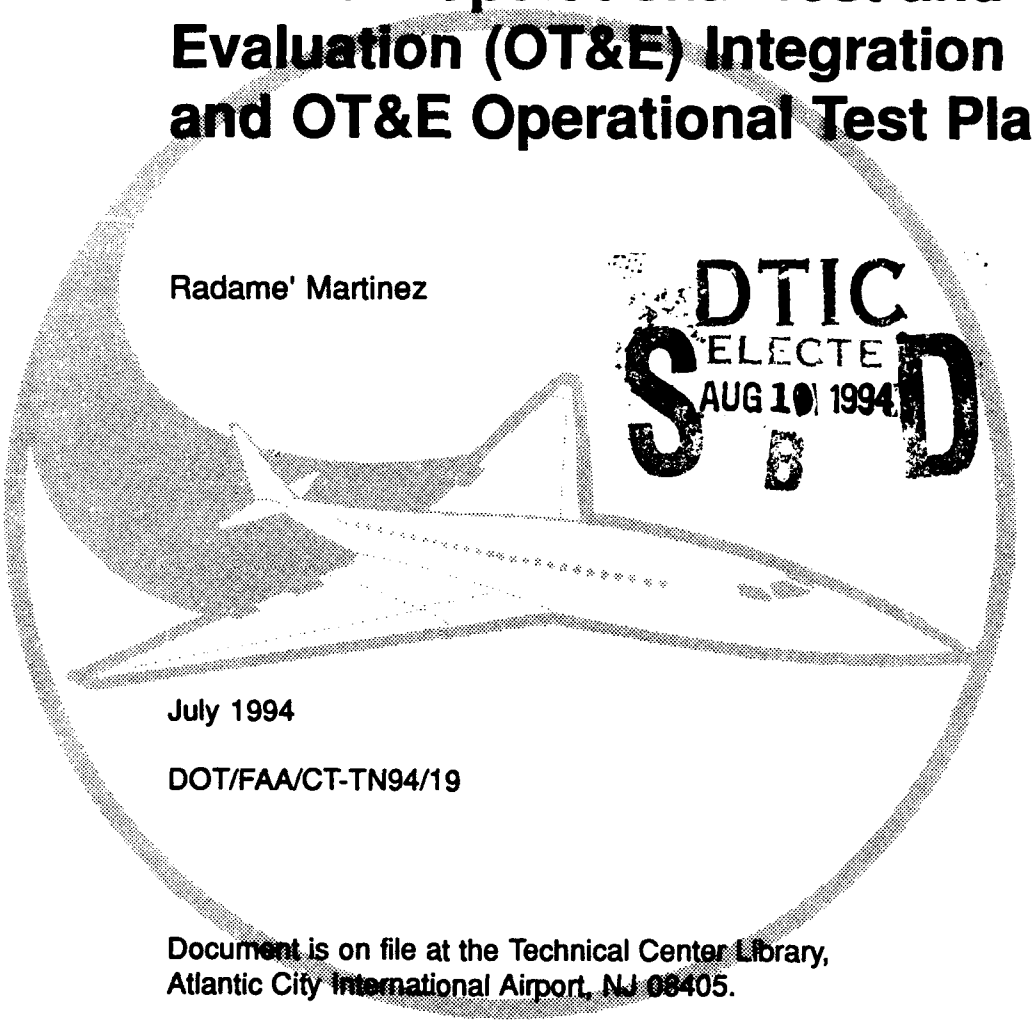
Terminal Doppler Weather Radar Build 5A Operational Test and Evaluation (OT&E) Integration and OT&E Operational Test Plan

Radame' Martinez



July 1994

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U.S. Department of Transportation
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Technical Center
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16. Abstract

The Terminal Doppler Weather Radar (TDWR) Build 5A Enhancement Operational Test and Evaluation (OT&E) Integration and OT&E Operational Test Plan provides the overall philosophy and approach to Build 5A OT&E testing, and identifies OT&E objectives, responsibilities, and resources.

The TDWR Build 5A enhancement provides connectivity to the Low Level Wind Shear Alert System (LLWAS) II to display LLWAS II wind data along with TDWR hazardous weather data on TDWR Geographical Situation Displays (GSD) and Ribbon Display Terminals (RDT).

The TDWR Build 5A OT&E is scheduled to occur at the TDWR site in Memphis, TN, March through May 1994.

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EXECUTIVE SUMMARY

This document presents the Terminal Doppler Weather Radar (TDWR) Build 5A Operational Test and Evaluation (OT&E) Operational and OT&E Integration Test Plan. This test plan is written in accordance with FAA-STD-024a and FAA Order 1810.4B, and provides the overall philosophy and approach to OT&E testing. In addition, this test plan identifies OT&E objectives, responsibilities, and resources.

The TDWR Build 5A software enhancement provides connectivity to the Low Level Wind Shear Alert System (LLWAS) II to display LLWAS II wind data along with TDWR hazardous weather data on TDWR Geographical Situation Displays (GSD) and Ribbon Display Terminals (RDT).

The TDWR Build 5A OT&E is scheduled to occur at the TDWR site in Memphis, TN, March through May 1994.

1. INTRODUCTION.

The Terminal Doppler Weather Radar (TDWR) is one project of the National Airspace System (NAS) Plan, whose overall goal is the modernization and improvement of the government systems supporting aviation commerce in the United States. In the end-state of the NAS Plan, the TDWR will send weather product information to air traffic control (ATC) computers at the Tower Control Computer Complex (TCCC). Also in the end-state, a mechanism will be provided to transmit TDWR hazard information directly to pilots. The end-users of TDWR outputs are local, approach, and departure controllers, along with their supervisors and pilots. In the interim NAS, the TDWR product information will be displayed to air traffic specialists; i.e., controllers and controllers' supervisors.

The Build 5 enhancement is intended to enable the TDWR to further meet the goals of the NAS Plan. This will be accomplished by interfacing the TDWR to the Low Level Wind Shear Alert System (LLWAS) and by upgrading some existing TDWR functionality.

The Build 5 enhancement for the TDWR is being implemented in two stages. The first stage is designated as Build 5A and the second as Build 5B. This test plan will address only that functionality included in Build 5A. In addition, the test plan has been tailored to address only those Operational Test and Evaluation (OT&E) Integration, OT&E Operational, and NAS-SS-1000 requirements not previously verified during baseline OT&E. However, some of the aforementioned requirements will be reverified to ensure baseline performance has not been degraded by the Build 5A enhancements.

The OT&E Integration and OT&E Operational testing has been completed on the baseline TDWR system. All NAS-SS-1000 requirements successfully verified during previous OT&E will be identified as such in the TVRTM included in appendix A. Some of these requirements will be verified again to ensure that the baseline system performance has not been degraded.

1.1 BACKGROUND.

Build 5A will provide an interface to the Low Level Wind Shear Alert System Phase II (LLWAS II). LLWAS II consists of six sensors and a computer system to process wind information. Build 5A will accept LLWAS II Center Field Wind (CFW) and display them on the Display Functional Unit (DFU) which is composed of a Geographic Situation Display (GSD) and up to eight Ribbon Display Terminals (RDTs). The commercial-off-the-shelf (COTS) GSD is being upgraded to the Sun SPARC IPX workstation as part of Build 5A. Also, LLWAS sensor winds can be mapped to specific runways for display as threshold winds on the GSDs and RDTs.

1.2 TEST PHILOSOPHY.

The Federal Aviation Administration (FAA) conducts OT&E in accordance with FAA Order 1810.4B to evaluate the subsystem operational effectiveness and suitability including compatibility, interoperability, degraded operations, survivability, maintainability, and supportability. The OT&E also identifies deficiencies in NAS hardware, software, human performance factors, and/or operational concepts. The OT&E consists of three phases: Integration, Operational, and Shakedown. Only OT&E Integration and OT&E Operational phases will be addressed in this test plan. Shakedown activities will be addressed in the AOS-230 OT&E Shakedown Test Plan. Division of responsibilities for FAA OT&E Integration and OT&E Operational testing are illustrated in figure 1.2-1. Since Build 5A is an enhancement to the TDWR, only those blocks not shadowed will be evaluated.

1.2.1 OT&E Integration.

The OT&E Integration consists of testing NAS System End-to-End performance, specifically, NAS-SS-1000, volume I, system level and volumes II through V, subsystem level requirements as identified in the TDWR Test and Evaluation Master Plan (TEMP) Verification Requirements Traceability Matrix (VRTM). This testing establishes NAS baseline performance (end-to-end) or verifies that previously existing NAS performance has not been degraded. To the greatest extent possible, the subsystem will test in a NAS system equivalent environment.

Testing at the Memphis, TN, TDWR site (MEM) will address and evaluate the readiness of the system for integration and transition into the field. In addition, this activity will evaluate the system performance in critical test areas, test the limits of system performance, and provide operational performance benchmarks.

The OT&E Integration effort is conducted with the following objectives:

a. Verify the TDWR's capability to properly interface and function with the associated NAS subsystems, including hardware, software, operational, and maintenance activities;

b. Ensure the early detection of interface design problems;

c. Minimize site problems by comprehensive integration testing and evaluation;

d. Support the collection of system reliability figures;

e. Verify the requirements of the NAS System Specification.

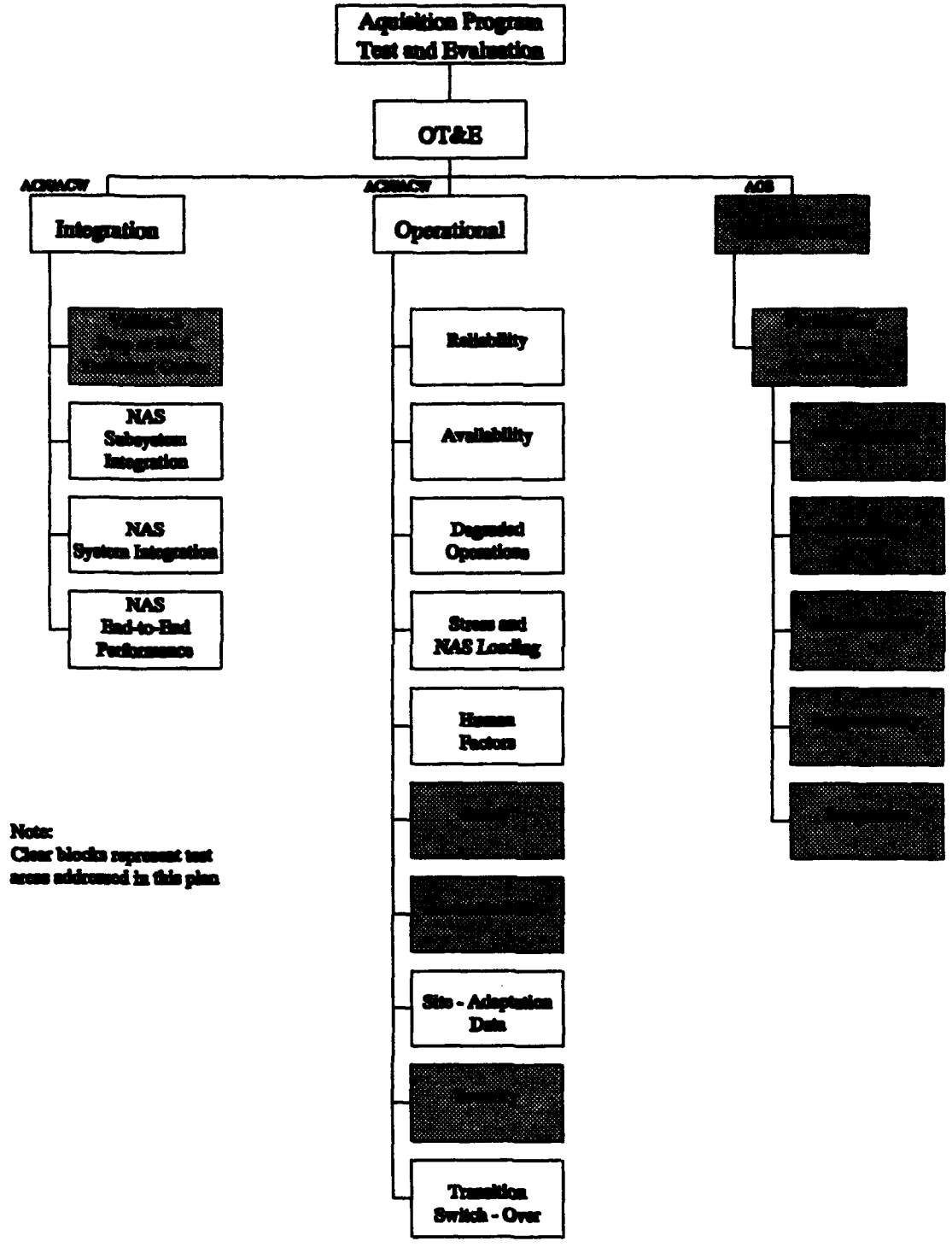

FIGURE 1.2-1. FAA OT&E TEST PHILOSOPHY

1.2.2 OT&E Operational.

The OT&E Operational testing has the intent of verifying the operational effectiveness and suitability of the equipment with user participation in the evaluation testing. Aspects of this testing are further defined as follows:

a. Reliability and availability;
b. Degraded operations and operational utilization scenarios;
c. Stress and NAS loading testing of all interoperable subsystems;
d. Human factors;
e. Site-adaptation;
f. Transition switchover.

The OT&E Operational testing employs system users to assess operational suitability and effectiveness of the subsystem in the NAS environment. Testing will be conducted at the MEM TDWR site in accordance with established OT&E requirements. This testing will address the evaluation of system functions, data entry and display devices, Human Engineering and Computer-Human Interface procedures, training, training documentation for ATC operations, systems maintenance, and support operations. Tests will be structured in a building block fashion starting with an evaluation of basic functions and operations, and progressing to evaluations during complex integrated operations.

The OT&E Operational test effort is conducted with the following objectives:

a. Verification and validation of the operational requirements;

b. Evaluation and determination of the effect of the segment under test on the operational mission;

c. Identification and evaluation of the safety factors involved during transition and determination that transition can be achieved safely;

d. Evaluation of the subsystem's operations and maintenance with respect to the variations in site configuration and adaptation;

e. Assessment of the subsystem's capability to support current and future modifications.

1.2.2.1 Reliability and Availability.

The OT&E will be conducted to estimate and verify that diagnostics accuracy, Mean Time Between Failure, and Mean Time Between Critical Failure are achievable in an operational environment.

1.2.2.2 Degraded Operations.

This test is conducted to determine the acceptability of the resultant operational degradation when failures are induced in the system. This includes validation of shutdown procedures, startup procedures, degraded operations procedures, and operational impact of the data preservation function.

1.2.2.3 Stress and NAS Loading.

This test estimates the levels of stress and NAS loading provided by the operational environment.

1.2.2.4 Human Factors.

This test estimates the degree to which the interaction of personnel with the system in the operational environment is accommodated. Test and evaluation (T&E) should explore such factors as the physical interaction of personnel with a system, interactions with procedures, workloads, and operational environments.

1.2.2.5 Site Adaptation.

This test ensures that site data unique to each applicable NAS facility has been correctly developed, updated, and installed in the system.

1.2.2.6 Transition Switchover.

This test is conducted to determine whether the system and procedures are such that a move from the old system to the new or vice versa can be accomplished without degrading NAS operations while minimizing impact on the user.

1.3 PURPOSE OF TEST PLAN.

The purpose of this plan is to ensure that comprehensive OT&E Integration and OT&E Operational testing is conducted. It will describe the test program and identify organizational responsibilities. It will also provide a basis for the development of OT&E Integration and OT&E Operational test procedures.

1.4 SCOPE OF TEST PLAN.

This plan provides for the comprehensive testing of the Build 5A enhancement to ensure it satisfies user and NAS requirements. It describes the OT&E Integration and OT&E Operational test processes for ensuring this enhancement meets applicable subsystem/system requirements allocated in NAS-SS-1000, volumes I, III, and V. A similar OT&E Integration and OT&E Operational Test Plan will be generated for the TDWR Build 5B enhancement.

1.5 DOCUMENT OVERVIEW/ORGANIZATION.

This paragraph describes each section of the test plan.

Section 1.: Introduction. This section provides an introduction to the TDWR Build 5A OT&E Integration and OT&E Operational Test Plan. In addition, it provides the purpose and scope of the test plan.

Section 2.: Documents. All documents directly referenced in the plan and all other documents related to this plan are listed in this section.

Section 3.: System Description. This section provides a brief system overview including a block diagram. It also identifies the current and future interfaces.

Section 4.: Test Program Description. This section describes the OT&E approach and concept, test environment, and test descriptions.

Section 5.: Test Management. This section defines the roles and responsibilities, training, test conduct, test reports, schedules, and personnel resource requirements.

Appendix A: This appendix is a detailed Test Verification Requirements Traceability Matrix (TVRTM).

2. DOCUMENTS.

This section lists the documentation and reference materials which relate to the contents of this plan.

2.1 REFERENCED DOCUMENTS.

FAA-E-2806/1	Terminal Doppler Weather Radar Specification, November 12, 1992, w/SCN 1, January 2, 1993.
NAS-SS-1000	NAS System Specification, volume I, Functional and Performance Requirements for the National Airspace System General, October 1992.
NAS-SS-1000	NAS System Specification, volume III, Functional and Performance Requirements for the Ground-to-Air Element, February 1993.
NAS-SS-1000	NAS System Specification, volume V, Functional and Performance Requirements for the National Airspace System Maintenance and Operations Support Element, October 1992.
NAS-IR-31023105 Part 2	Low Level Wind Shear Alert System (LLWAS), Phase II to Terminal Doppler Weather Radar (TDWR) Interface Requirements Document.
NAS-IC-31055103-00	TDWR Remote Monitoring Subsystem (RMS)/Maintenance Processor Subsystem (MPS) Interface Control Document.
NAS-IC-31055104-00	TDWR/Maintenance Data Terminal (MDT) Interface Control Document.
NAS-IC-31052201-00	TDWR/Tower Control Computer Complex (TCCC) Interface Control Document.
FAA-STD-024a	Preparation of Test and Evaluation Documentation, August 17, 1987.
No. 1810.4B	FAA NAS Test and Evaluation Policy, October 22, 1992.

2.2 BACKGROUND DOCUMENTS.

TDWR TEMP	Terminal Doppler Weather Radar, Build 5 Revision, Test and Evaluation Master Plan, November 1993.
NAS-MD-110	Test and Evaluation (T&E) Terms and Definitions for the NAS, March 27, 1987.
NAS-MD-790	Remote Maintenance Monitoring System (RMMS) Interface Control Document, June 10, 1986.
D001-Bld5-2	TDWR Contractor's Master Test Plan (CMTP) Build 5 Addendum, January 12, 1993.
B022-Bld5-1A	Build 5 Software Requirements Specification Radar Product Generation (RPG) Software, CSCI-2 CGG551591, Revision A, November 19, 1992.
B022-Bld5-2B	Build 5 Software Requirements Specification Remote Monitoring Subsystem (RMS) Software, CSCI-3 CGG551592, Revision B, June 30, 1993.
B022-Bld5-3B	Build 5 Software Requirements Specification Display Computer (DPL) Software, CSCI-4 CGG551594, Revision B, June 24, 1993.

3. SYSTEM DESCRIPTION.

The primary goal of the TDWR is to enhance the safety of air travel through the timely detection and reporting of hazardous wind shear in and near the terminal approach and departure zones of an airport. Specific sources of hazardous wind shear to be detected are microbursts and gust fronts. The secondary goal of the TDWR is to improve the management of air traffic in the terminal area through the forecast of gust front induced wind shifts at the airport, as well as detection of precipitation.

3.1 SYSTEM OVERVIEW.

3.1.1 Equipment Description.

The TDWR can be functionally divided into three subsystems: radar data acquisition (RDA), Radar Product Generation/Remote Monitoring Subsystem (RPG/RMS), and the Display Functional Unit (DFU).

The RDA function performs the radar data collection, detection, signal processing, clutter suppression, control monitoring, and error detection subfunctions for the TDWR system. The RDA consists of the Antenna Group (ANT) which includes the Radome, Pedestal Assembly, Tower Assembly, Reflector Assembly, Servo Control Unit (SCU), and Moving Target Simulator (MTS). The RDA also includes the microwave pallet and redundant Transmitters (XMTs), Receiver/Exciters (REXs), and Digital Signal Processors (DSPs).

The RPG/RMS functions process moment/dwell data from the RDA, exchange control and status signals with the RDA, transmit data to the DFU, and provide the interfaces to LLWAS II/III, Remote Maintenance Monitoring System (RMMS)/Maintenance Data Terminal (MDT), and Tower Computer Control Complex (TCCC).

The DFU equipment consists of a Geographical Situation Display (GSD) for viewing weather products, and from zero to eight alphanumeric Ribbon Display Terminals (RDT) for viewing alert messages. GSD capabilities also include range scale selection, recentering of displayed products, selection of runway configuration, and archiving of weather products.

3.1.2 Equipment Architecture.

The TDWR system is configured into Hardware Configuration Items (HWCIs) and Computer Software Configuration Items (CSCIs). A TDWR HWCI and CSCI block diagram is included in figure 3.1.2-1.

The software consists of operational and nonoperational software. Operational software consists of operating systems (which are COTS products), application software CSCIs, and firmware CSCIs. The commercial operating systems are VRTX-32 Operating System (CSCI-7) for the 68020 single board computers, the Data Processing Operating System (CSCI-10) for the RPG/RMS, and the Display System Operating System (CSCI-11) for the DFU. Nonoperational software which is not part of TDWR site installations consists of the Software Development Tools (CSCI-5) and the Test Tools Library (CSCI-6).

The HWCIs consist of the following:

a. Antenna Group (ANT) HWCI-1
b. Transmitter (XMT) HWCI-2
c. Receiver-Exciter (REX) HWCI-3
d. Digital Signal Processor (DSP) HWCI-4
e. Radar Product Generator/Remote Monitoring Subsystem (RPG/RMS) HWCI-5
f. Display Functional Unit (DFU) HWCI-6
g. Special Test Equipment (SPT) HWCI-7
h. Program Support Facility (PSF) HWCI-8

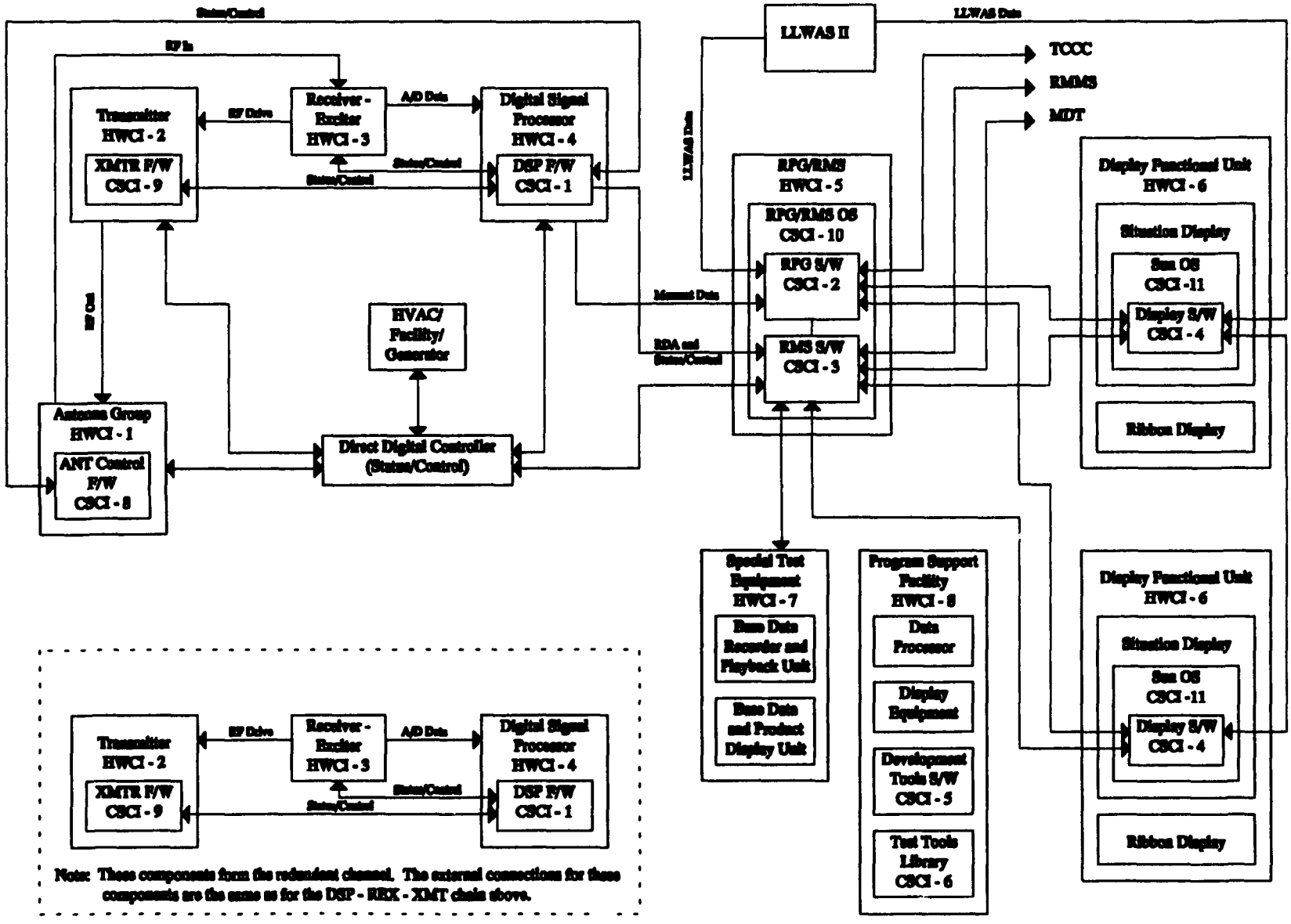

FIGURE 3.1.2-1. TDWR BLOCK DIAGRAM

The CSCIs consist of the following:

a. Operational Software

1. Application Software

(a) Digital Signal Processor (DSP) CSCI-1
(b) Radar Product Generator (RPG) CSCI-2
(c) Remote Monitoring Subsystem (RMS) CSCI-3
(d) Display Computer (DPL) CSCI-4
(e) Antenna Control (ANT) CSCI-8 (Firmware)
(f) Transmitter Control (XMT) CSCI-9 (Firmware)

2. Operating Systems

(a) VRTX-32 Operating System (VTX) CSCI-7
(b) Data Processing Operating System (DPO) CSCI-10
(c) Display System Operating System (UNIX_UNX) CSCI-11

b. Nonoperational Software

1. Software Development Tools (SDT) CSCI-5
2. Test Tools Library (TTL) CSCI-6

3.2 INTERFACES.

Build 5A will provide external interfaces to LLWAS II, Remote Maintenance Monitoring Subsystem (RMMS)/Maintenance Data Terminal (MDT), and Tower Computer Control Complex (TCCC). These interfaces are shown in figure 3.2-1.

3.2.1 LLWAS II.

The TDWR to LLWAS II communications interface will consist of a primary and backup interface, and is described in NAS-IR-31023105, Part 2, Revision A. The primary interface will connect the TDWR RPG to the LLWAS Tower Display port on the LLWAS processor. The backup interface will connect the TDWR Tower GSD to the LLWAS Spare port on the LLWAS processor. In the event of a primary interface failure, the switch-over from primary to backup will occur automatically. Both interfaces will operate at 1200 bits per second (bps). Figure 3.2.1-1 presents the TDWR - LLWAS II interface.

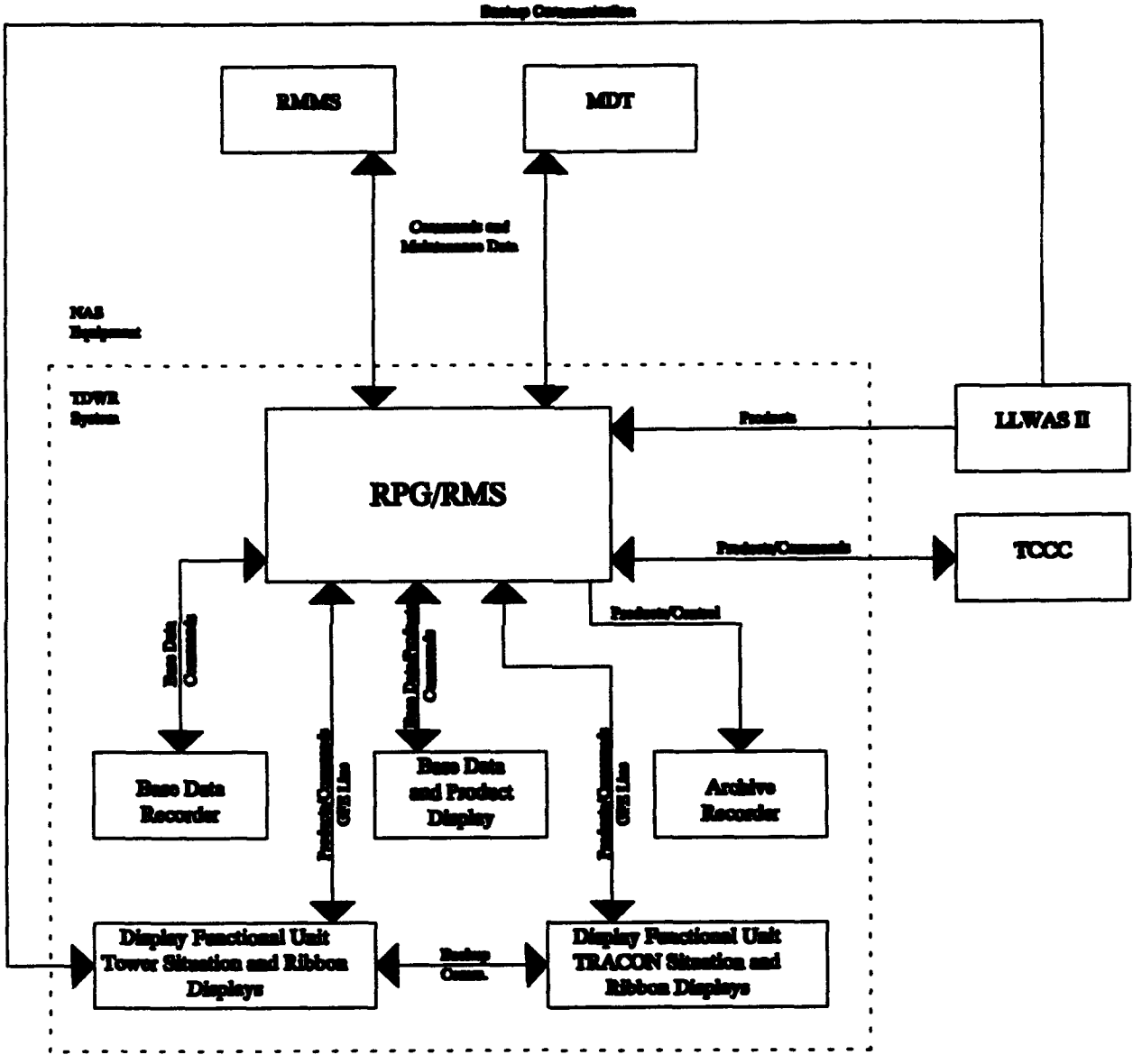

FIGURE 3.2-1. TDWR BUILD 5A EXTERNAL INTERFACES

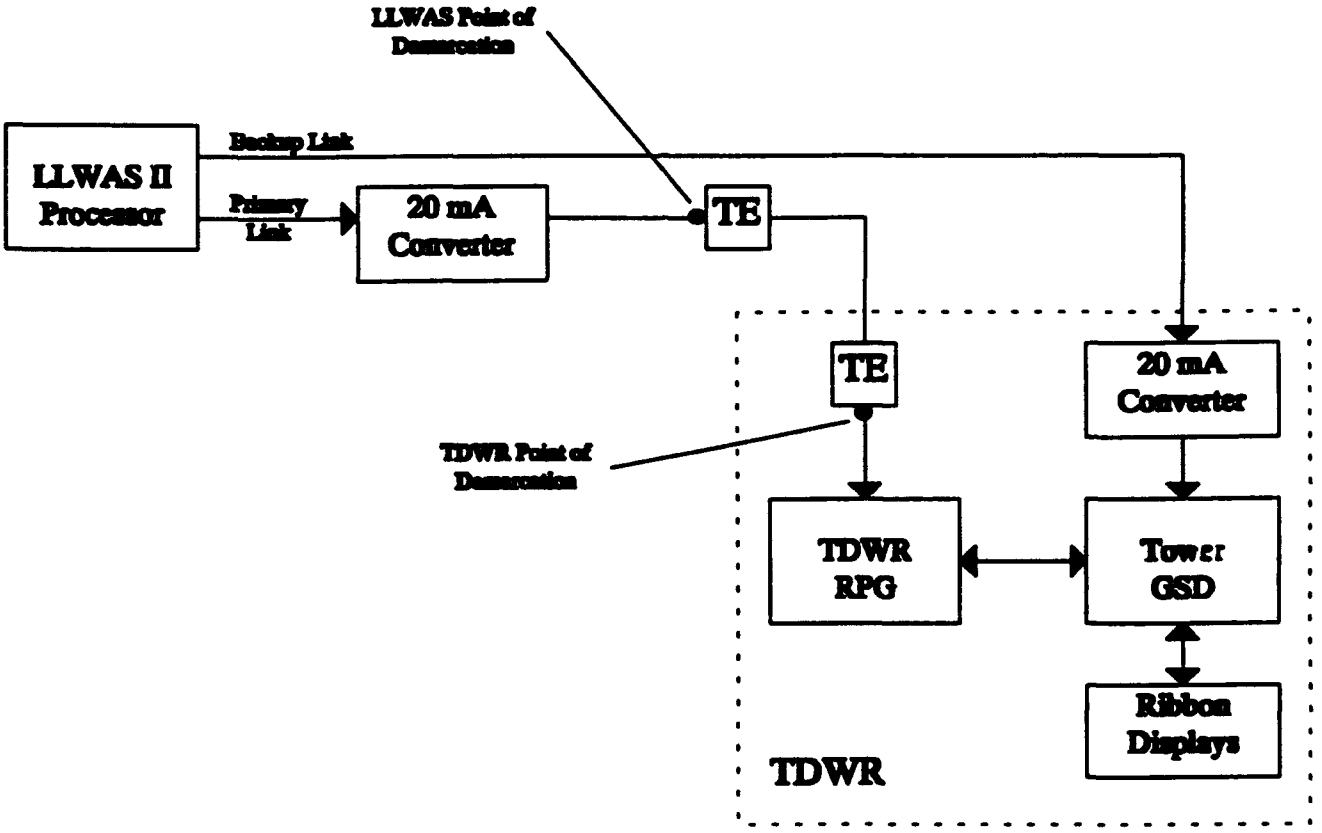

FIGURE 3.2.1-1. TDWR--LLWAS II INTERFACE

3.2.2 RMMS.

The TDWR RPG/RMS provides the following interfaces:

a. RMMS: The RMMS utilizes the MPS to remotely control and monitor the TDWR. This interface is described in NAS-MD-790.

b. MDT: The MDT is located at the TDWR site in the Concrete Masonry Unit (CMU) and is used to locally control and monitor the TDWR. This interface is described in NAS-MD-790. This interface can operate at 1200, 2400, 4800, and 9600 bps.

These interfaces are presented in figure 3.2.2-1.

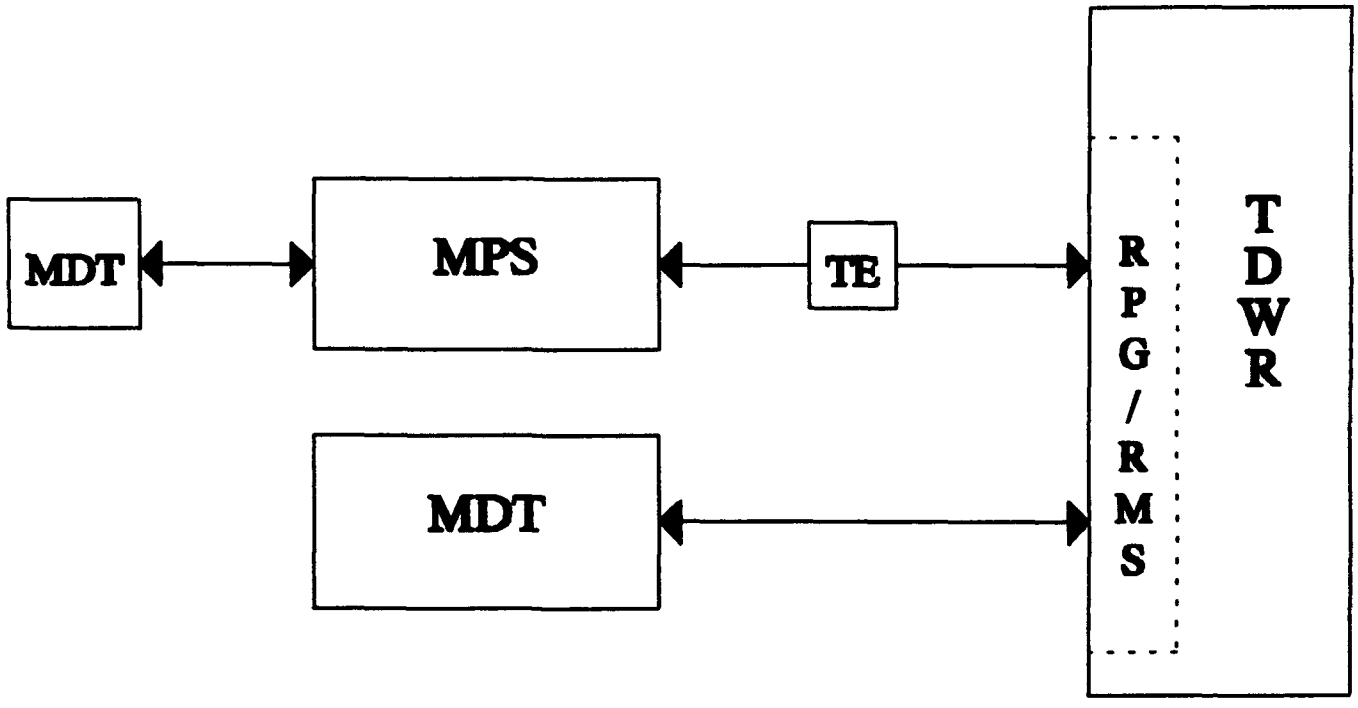

FIGURE 3.2.2-1. TDWR--RMMS INTERFACE

3.2.3 TCCC.

The TDWR interfaces to TCCC which provides for transmission of products, equipment status, TDWR modes, and receipt of commands. When the TCCC becomes available, it will provide data to appropriate ATC facilities. It operates at 9600 bps and is described in NAS-IR-22013105, Revision E. This interface is presented in figure 3.2.3-1.

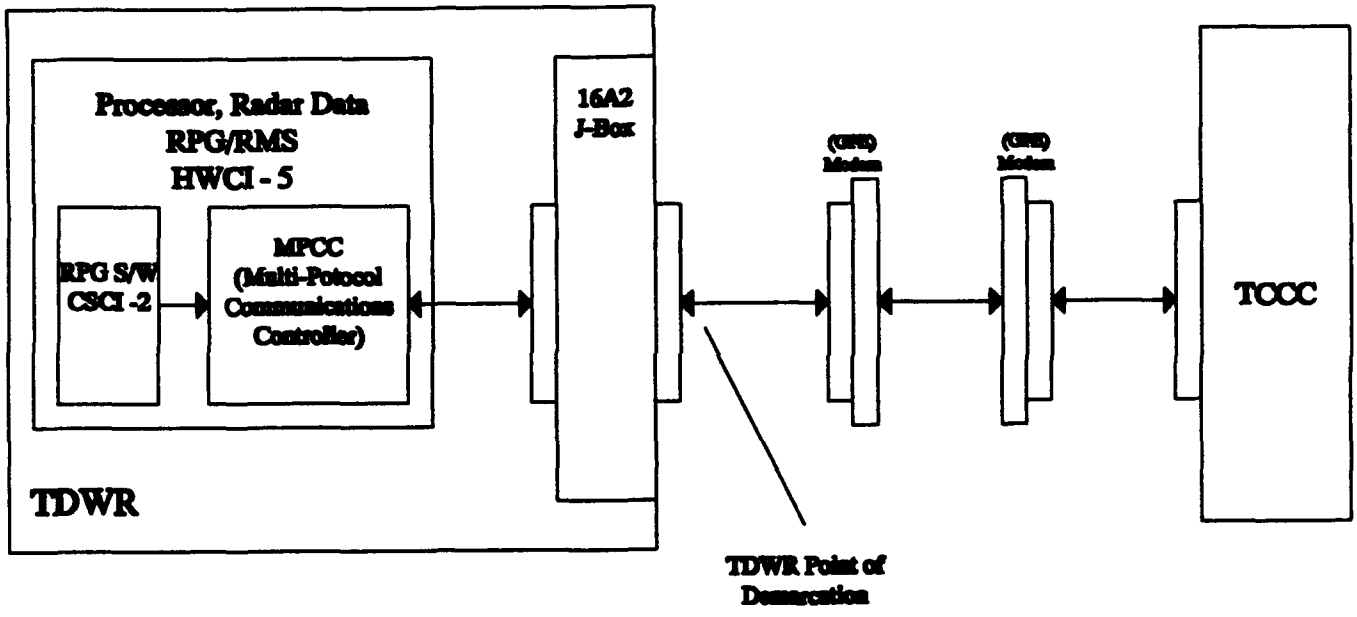

FIGURE 3.2.3-1. TDWR--TCCC INTERFACE

4. TEST PROGRAM DESCRIPTION.

4.1 APPROACH AND CONCEPT.

In order to determine the operability of the TDWR Build 5A enhancement, OT&E Integration and OT&E Operational testing requires that the TDWR be installed in an operational environment with operational support. An operational environment refers to the configuration into which the TDWR must be integrated. For this reason, both live and/or simulated interfacing subsystems and equipment will be used. Air Traffic (AT) and Airways Facilities (AF) field site personnel will also be requested to participate in test efforts. These test efforts will include providing support writing and executing the detailed test procedures that will be generated by ACW-200 to verify the requirements identified for testing. The TDWR OT&E Integration and OT&E Operational testing will be performed using all interfaces available and appropriate to the TDWR system.

4.1.1 Operational Issues/Test Requirements Summary.

The following are issues related to the Build 5A enhancement:

a. LLWAS II wind information is accurately displayed on the GSDs and RDTs.

b. TDWR/LLWAS II link status is reported accurately to the RMMS and MDT.

c. The performance of baseline Build 4 has not been degraded using Build 5A enhancements.

All NAS-SS-1000 requirements related to TDWR have been included in Test Verification Requirements Traceability Matrices (TVRTM) in appendix A. The specific Build 5A requirements which will be tested during Build 5A OT&E are identified. Previously verified NAS requirements, which will not be fully tested during Build 5A OT&E, are also identified.

4.1.2 Preliminary Activities Leading to Testing.

Prior to OT&E Integration and OT&E Operational testing, ACW-200 shall prepare the Build 5A OT&E Integration and OT&E Operational test procedures. In addition, the Build 5A enhancement will have successfully undergone extensive Development Test and Evaluation (DT&E). This testing is conducted by the prime contractor and witnessed by the FAA. Finally, the prime contractor will install the Build 5A enhancement and successfully complete the Build 5A Interface test at the TDWR site in Memphis. The OT&E Integration and OT&E Operational test flow diagram is provided in figure 4.1.2-1.

4.1.3 Planning Considerations and Limitations.

The TDWR/TCCC interface software will be tested under Build 5B DT&E testing. The OT&E testing will be conducted on TDWR/TCCC interface during Build 5B OT&E.

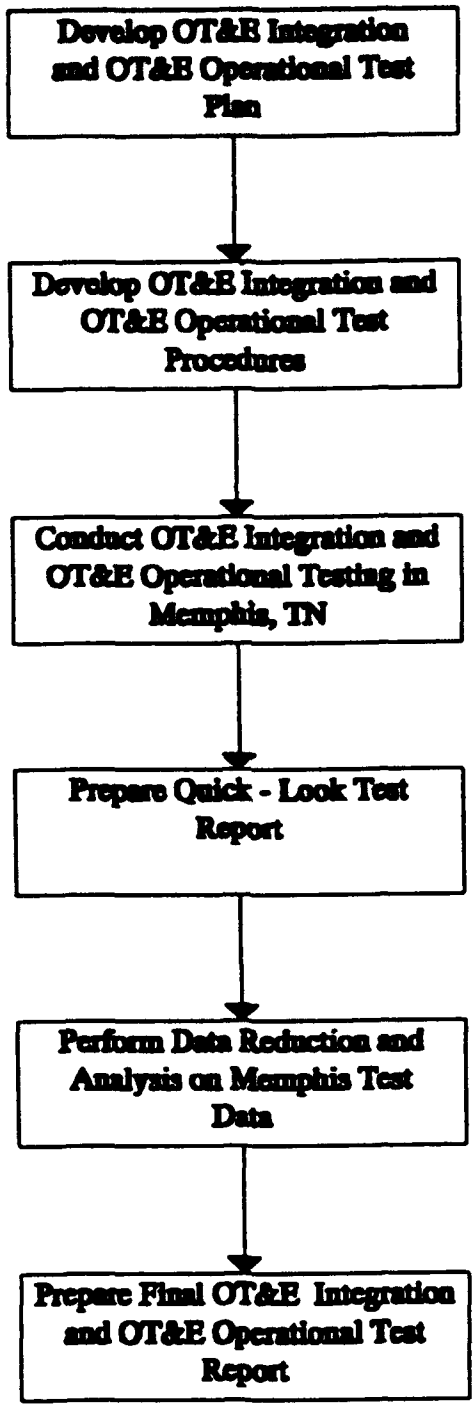

FIGURE 4.1.2-1. TEST FLOW DIAGRAM

4.2 TEST ENVIRONMENT.

The following paragraphs will describe the test facilities where the OT&E testing described in this plan will be conducted.

4.2.1 Test Location.

The Build 5A enhancement OT&E Integration and OT&E Operational testing will be conducted at the Memphis International Airport (MEM) TDWR site located in Nesbit, Mississippi.

4.2.2 Test Configuration.

The MEM TDWR is a typical site installation including all HWCIs (except HWCI-8) and all CSCIs (except CSCI-5 and CSCI-6) identified in paragraph 3.1.2. The CSCIs that were modified for Build 5A include CSCIs-2, 3, and 4. The only HWCI modified for Build 5A is HWCI-6 where the Sun-IPX workstation will replace the Sun 386 workstation as the GSD.

An LLWAS anemometer simulator will be used to verify that the TDWR accurately displays LLWAS Center Field and Sensor winds. An MPS simulator and a TCCC simulator will be used to verify that these interfaces exist and are functional. Also, the TDWR Special Test Equipment (HWCI-7), Base Data Recorder (BDR), and Base Data Display (BDD) will be utilized to record and playback TDWR base data. Protocol analyzers will be installed in the primary and backup links to monitor TDWR/LLWAS II communications.

4.2.3 Environmental Conditions.

A lack of convective weather during the scheduled test period could impact the completion of testing. Should favorable test weather not occur, testing may have to be extended or simulations used. One solution is to playback the TDWR base data (previously recorded during the 1993 OT&E Operational AT Evaluation in Memphis) with live LLWAS II data.

4.2.4 Test Analysis and Tools.

An LLWAS anemometer simulator will be used at the LLWAS Center Field Wind sensor and at least one other LLWAS sensor to ensure simulated wind speed and direction is accurately displayed on the TDWR displays. An MPS simulator and a TCCC simulator will be used to verify that those TDWR interfaces exist and are functional. The TDWR Special Test Equipment will be used to record and play back TDWR base data. Protocol analyzers will be used to monitor TDWR/LLWAS II primary and backup communications links.

4.3 OT&E INTEGRATION TEST DESCRIPTIONS.

4.3.1 TDWR--LLWAS II Interface Test.

4.3.1.1 Test Objectives.

This test will verify that LLWAS II Center Field Wind (CFW) and sensor winds are accurately displayed on the GSDs and RDTs.

The following TVRTM requirements will be verified under this test:

3001, 3020, 3021, 3022, 3024, 3053.

4.3.1.2 Test Approach.

An LLWAS anemometer simulator will be used to simulate wind speed and direction at the CFW sensor and one other sensor that has been mapped to a runway. The GSDs and RDTs will be monitored as the wind speed and direction are varied. This test is similar to the test that was used to verify Build 4+ functionality. This test scenario will utilize both TDWR operational and maintenance modes.

4.3.2 TDWR--RMMS Interface Test.

4.3.2.1 Test Objectives.

The objective of this test is to verify that the TDWR--MPS and the TDWR--MDT interfaces exist and are functional. ACN-100D, with assistance from ACW-200D, will conduct Build 5 OT&E Integration to verify NAS-SS-1000, volumes III and V requirements for the TDWR--MPS and TDWR--MDT interfaces after the baseline Interim Monitor and Control Software (IMCS) module has been completed and tested. The Build 5A modifications to the TDWR--MDT interface will be verified during OT&E Operational testing.

TVRTM requirement 3054 will be verified under this test.

4.3.2.2 Test Approach.

The system MDT will be used to control and monitor TDWR throughout Build 5A OT&E Integration and OT&E Operational testing. During OT&E Operational Degraded Operations scenarios, the LLWAS--RPG and LLWAS--DFU communications performance parameters will be verified using the system MDT.

4.3.3 TDWR--TCCC Interface Test.

This test will ensure there is a functional port allocated for TCCC. This test will be conducted during Build 5B OT&E and will be further addressed in the Build 5B OT&E Integration and OT&E Operational Test Plan. ACN-300, with assistance from ACW-200D, will perform OT&E Integration when the TCCC becomes available.

4.4 OT&E OPERATIONAL TEST DESCRIPTIONS.

4.4.1 System Reliability/Availability Test.

4.4.1.1 Test Objectives.

System operation will be monitored to verify that diagnostic accuracy, Mean Time Between Failure (MTBF) and Mean Time Between Critical Failure (MTBCF), are achievable in an operational environment. This data will be used to support the data collected during baseline OT&E Operational testing, as well as verify that the Build 5A enhancement has not degraded TDWR system reliability/availability.

4.4.1.2 Test Approach.

During Build 5A OT&E test conduct, all TDWR system failures will be recorded and classified as critical or noncritical. For system reliability tests, the TDWR will be run in a Hands-Off mode and it will be verified that any failures of interrelated NAS subsystems do not affect TDWR reliability. Diagnostics will be performed in event of a failure and all diagnostic results will be recorded. In the event of critical failure, the system down time will also be recorded.

4.4.2 Degraded Operations Test.

4.4.2.1 Test Objectives.

This test is conducted to determine the acceptability of the resultant operational degradation when failures are induced into the NAS system. Operational scenarios will be used to verify TDWR response to TDWR/LLWAS II failure modes.

4.4.2.2 Test Approach.

This test will verify that the TDWR responds properly during the following scenarios:

a. TDWR and LLWAS II operational,
b. TDWR operational and LLWAS II nonoperational,
c. TDWR nonoperational and LLWAS II operational,
d. TDWR and LLWAS II nonoperational.

In addition, proper TDWR response will be verified when LLWAS--RPG, LLWAS--GSD, and/or RPG--GSD link communications are interrupted.

4.4.3 Stress and NAS Loading Test.

4.4.3.1 Test Objectives.

This test will demonstrate the TDWR response to stress and NAS loading provided by a weather scenario test tape.

4.4.3.2 Test Approach.

This test will stress the TDWR by utilizing all available interfaces during periods of hazardous weather activity. This test will involve playback of a weather scenario test tape with runways mapped to all lines of all RDTs. The LLWAS switchover override option will also be enabled to more closely simulate a live operational environment. In the event significant hazardous weather activity occurs during the test period, this test will be conducted using a live operational environment.

4.4.4 Human Factors Evaluation.

4.4.4.1 Test Objectives.

This evaluation will explore the physical interaction of AT personnel with the Build 5A enhancement.

TVRTM requirement 3055 will be verified during this test.

4.4.4.2 Test Approach.

ACW-200D will monitor and observe tower and Terminal Radar Approach Control (TRACON) controllers and supervisors while using the LLWAS/TDWR data. A questionnaire will be used to evaluate Build 5A function useability.

4.4.5 Site-Adaptation Verification.

4.4.5.1 Test Objectives.

This test ensures that site data unique to each applicable NAS facility has been correctly developed, updated, and installed in the system.

4.4.5.2 Test Approach.

Site parameters will be selected at random and compared against the Site Survey Reports. If necessary, site setup utilities will be used to verify these parameters. AOS-230 will assist in the generation of detailed test procedures, and will assist in test conduct.

4.4.6 Transition Switchover Plan.

4.4.6.1 Test Objectives.

The objective of this test is to verify the transition from the operational LLWAS system to the TDWR-LLWAS interface system, and vice versa, does not degrade NAS operations and minimize impact upon the user. A transition switchover will be evaluated for both hardware and software changes.

4.4.6.2 Test Approach.

ACW-200D will develop a test procedure to ensure the transition switchover does not degrade NAS operations.

4.4.7 Weather Performance Evaluation.

4.4.7.1 Test Objectives.

The objective of this test is to verify the TDWR meets operational suitability and reliability requirements in relation to its ability to detect hazardous weather.

The following TVRTM requirements will be verified under this test:

1001, 1003, 1004, 1005, 1006, 1007, 1009, 1020, 1021, 1022, 1023, 1024, 1025, 3002, 3003, 3004, 3009, 3010, 3011, 3012, 3014, 3015, 3016, 3017, 3018, 3021, 3022, 3024, 3025.

4.4.7.2 Test Approach.

A meteorologist from the National Severe Storms Laboratory (NSSL) will conduct a 1-week operation performance check of the TDWR prior to the start of Build 5A OT&E testing. The meteorologist will verify Build 5A does not adversely affect TDWR base data quality or TDWR alarms on the GSD and RDT.

5. TEST MANAGEMENT.

5.1 ROLES AND RESPONSIBILITIES.

This section describes the various organizations and personnel that will manage, conduct, and support the testing.

5.1.1 Test Management Organization.

5.1.1.1 Program Manager, ANR-500.

The Program Manager (PM) is responsible for management of the program. In particular, the PM has responsibilities for the OT&E Integration and OT&E Operational test effort as described in FAA Order 1810.4B. Specifically, the PM:

a. Manages the overall T&E program;

b. Arranges with the Associate Program Manager for Test (APMT) for T&E support, coordination, and monitoring;

c. Reviews and approves OT&E Integration and OT&E Operational test requirements, plans, procedures, and reports;

d. Monitors OT&E Integration and OT&E Operational tests.

5.1.1.2 Technical Officer, ANR-900.

The Technical Officer is responsible for the technical direction of the TDWR program. Specific responsibilities include:

a. System Design,
b. Design Qualification Test and Evaluation,
c. Implementation,
d. Logistics Support.

5.1.1.3 Associate Program Manager for Test, ACW-200.

The Associate Program Manager for Test (APMT) is responsible for management of the OT&E Integration and OT&E Operational test effort. In particular, the APMT has responsibilities for the OT&E Integration and OT&E Operational test effort as described in FAA Order 1810.4B. Specifically, the APMT:

a. Supports the development of test policy and test standards;

b. Acts as an agent of the PM to manage the T&E program. This includes establishing test schedules, coordination of tests, ensuring that all test requirements are satisfied, and that tests are performed in accordance with approved procedures;

c. Coordinates with performing organizations and monitors OT&E activities;

d. Prepares OT&E Integration and OT&E Operational test requirements;

e. Prepares OT&E Integration and OT&E Operational test plans, procedures, and reports;

f. Directs and conducts OT&E Integration and OT&E Operational tests.

5.1.2 Other Participating Organizations.

This section shall describe any specific roles and responsibilities beyond those described in agency orders or directives. The description could include just a simple reference to the directive (e.g., organizational roles and responsibilities will be as described in FAA Order 1810.4B), but should include some specific information (e.g., the use of operational user teams as test subjects or test observers).

5.1.2.1 Operation Support Service, AOS-230.

This organization identifies and develops, with the PM and APMT, OT&E Shakedown requirements. In addition, they are responsible for conducting OT&E Shakedown testing. They provide assistance and support during the OT&E Integration and OT&E Operational test effort by reviewing the OT&E Integration and OT&E Operational Test Plan, Test Procedures, and Test Reports. They also monitor OT&E Integration and OT&E Operational tests and optionally participate in OT&E Integration and OT&E Operational test conduct.

5.1.2.2 Air Traffic Plans and Requirements Service, ATR-120.

This organization provides operational expertise and planning for conducting and analyzing tests. They provide assistance and support during the OT&E Integration and OT&E Operational test effort by reviewing the OT&E Integration and OT&E Operational Test Plan, Test Procedures, and Test Reports. They also provide personnel for conducting and/or monitoring OT&E Integration and OT&E Operational tests.

5.1.2.3 Regional Airway Facilities Division, AF.

This organization supports the APMT in the development of OT&E test requirements. They participate in the preparation and conduct of OT&E Integration and OT&E Operational tests as coordinated by ACW-200.

5.1.2.4 Office of Independent Operational Test and Evaluation Oversight, ATQ-1.

This organization provides assistance and support during the OT&E Integration and OT&E Operational test effort by reviewing the OT&E Integration and Operational Test Plan, Test Procedures, and Test Reports. In addition, they provide personnel to monitor OT&E Integration and OT&E Operational tests.

5.1.2.5 Engineering, Test, and Evaluation Service, ACN-100.

This organization provides assistance and support during the OT&E Integration and OT&E Operational test effort by preparing and executing the RMMS test procedures. They will then provide ACW-200 with a test report for inclusion into the OT&E Integration and OT&E Operational Test Report.

5.1.2.6 National Severe Storms Laboratory, NSSL.

This organization provides meteorological assistance and support during the OT&E Integration and OT&E Operational test effort by verifying TDWR base data and weather products. They will then provide ACW-200 with a test report for inclusion into the OT&E Integration and OT&E Operational Test Report.

5.1.3 Test Conduct Team.

This section describes the responsibilities of the test team.

5.1.3.1 Test Director, ACW-200.

The Test Director is appointed by the APMT. Specifically, the Test Director:

a. Ensures the OT&E Integration and OT&E Operational test effort follows the specific test plan and procedures;

b. Ensures all required equipment and personnel are available prior to the start of the test;

c. Ensures all relevant data for analysis is collected;

d. Maintains a daily test log;

e. Conducts pretest and post-test briefings;

f. Provides the status of all testing activities to the APMT.

5.1.3.2 Test Manager.

A Test Manager is not needed for the TDWR OT&E Integration and OT&E Operational testing.

5.1.3.3 Test Operators, ACW-200, AOS-230, ATR-120, ACN-100, AF.

Test Operators are responsible for manning the test positions during a particular test. They follow the test procedures and record all test results. In addition, they will assist the Test Director in maintaining the daily test log. The Test Operators report to the Test Director.

5.1.3.4 Test Monitors, ACW-200, AOS-230, ATR-120, NSSL.

Test Monitors are responsible for ensuring that the test scenarios and procedures are being followed by the Test Operators. Test Monitors assist the Test Operators by reporting observations, assisting in the recording of measurements, and keeping track of day-to-day activities by maintaining test logs.

5.1.3.5 Test Witness, ATO-1.

Test Witness personnel are official FAA representatives that witness the test and provide a written assessment verifying compliance to accepted test plans and procedures.

5.2 TRAINING.

The following paragraphs will describe the training needed to develop and execute the OT&E Integration and Operational test procedures.

5.2.1 Test Developer Training.

No formal TDWR training is required for test procedure development and execution. However, a thorough understanding of TDWR system operation including the use of the System MDT, RPG/RMS MDT, BDD, BDR, GSDs, and RDTs is required.

5.2.2 Test Participant Training.

Test participants should also be familiar with overall TDWR system operations including the MDTs, BDR, and all displays.

5.2.3 Sector Maintenance Support Training.

The Memphis Sector Field Office (MEM-SFO) technicians shall have undergone the 280-hour FAA TDWR Maintenance Training course in order to provide adequate maintenance support to the Test Director.

5.2.4 Special Training Requirements.

ACW will ensure specially trained individuals are available to operate the anemometer simulator and the protocol analyzer.

5.3 TEST CONDUCT.

5.3.1 Quality Control and Configuration Management.

AOS-230 will officially provide software. Version Numbers/Checksums will be as indicated in AOS-230 Site Program Bulletin (SPB). Testing software will be validated as follows:

a. RPG/RMS - System MDT Data Processor Performance Screen, Version Number should be the same as indicated in the SPB.

b. DFU - System MDT DFU Performance Screen, Version Number should be the same as indicated in the SPB.

c. DSP - System MDT Channel A/B Performance Screen, DSP Checksum should be the same as indicated in the SPB.

d. Antenna - System MDT Antenna Performance Screen, Antenna Checksum should be the same as indicated in the SPB.

e. Transmitter - System MDT Transmitter Performance Screen, Transmitter Checksum should be the same as indicated in the SPB.

5.3.2 Test Readiness Criteria.

ACW-200D will conduct Build 5A OT&E Integration and OT&E Operational tests after contractor on-site Design Qualification Tests (DQT) are completed and a configuration audit is performed.

5.4 TEST REPORTS.

The following subsections define the necessary reports that will be generated during OT&E Integration and OT&E Operational testing.

5.4.1 Individual Test Results Reporting.

Individual test results will be recorded by Test Operators in the spaces provided in each test procedure. At the conclusion of each test, a summary of the test results will be included in the test procedure.

5.4.2 Service Reports.

The Test Director will ensure all test discrepancies and problems observed during testing are documented in Service Reports (SR). The SRs will be forwarded to the Program Office for resolution. The Service Report format will be the same as in previous TDWR OT&E testing.

5.4.3 Periodic Test Status Reports/Briefings.

This paragraph identifies the type of briefings that will be conducted throughout OT&E Integration and OT&E Operational testing.

5.4.3.1 Pretest Briefings.

This briefing, chaired by the Test Director, will be scheduled immediately prior to the start of each test and attended by all personnel participating in the test. The pretest briefing will include the status of prerequisites, software, system equipment, test equipment, and a test summary.

The pretest briefing consists of a brief explanation of the type of test that will be conducted, what the test will attempt to accomplish, and the hardware/software configuration that will be utilized for the test. The pretest briefing will also accomplish the following:

a. Identify any needed changes and red-line the procedures accordingly;

b. Review the hardware and software configurations of the test environment;

c. Ensure that all items in the material checklist (contained in the test procedures) have been received;

d. Provide Service Report forms to attendees;

e. Generate a record of the pretest briefing.

5.4.3.2 Post-Test Briefing.

This briefing will be conducted shortly after test completion. It is chaired by the Test Director and attended by all test personnel. The purpose of the meeting is to review the results of the test activity. An assessment of the quality of the test and the impact of the problems (i.e., SRs) will be discussed during the review of the Test Director's post-test briefing package.

The post-test briefing package, prepared by the Test Director prior to the post-test briefing, should consist of the following:

a. The "as-run" hardware and software configuration, how it differed from that stated in the procedures, and its significance to the test results;

b. Any deviations, planned and unplanned, in the test procedure steps and their significance to the test results. Procedure steps with problems noted and/or SRs initiated against them should be rescheduled for retest;

c. Any discrepancies, anomalies, and exceptions that were recorded during the test and their significance to the test results;

d. A summary of the outcome of the test. This summary can be derived by reviewing the test logs, test data, and SRs that were generated.

5.4.3.3 Status Briefings.

These briefings will serve to keep the TDWR Test Support Group abreast of the status of OT&E Integration and OT&E Operational testing. These meetings will be chaired by ACW-200 and will commence just prior to the start of OT&E Integration and OT&E Operational testing. They will serve as a technical interchange of issues and concerns.

5.4.4 Quick Look Report.

A Quick Look report will be written within 10 working days after test completion. This report will include a description of the test, a summary of test activities, significant test results that are known at the time, and test result conclusions. It will provide an immediate indication of the outcome of the test and highlight test discrepancies noted during test execution and their significance.

The Quick Look Test Report will contain the following:

a. Quick Look Test Report title page.
b. Executive Summary.
c. Introduction.
d. OT&E Description.
e. Results.
f. Conclusions.

5.4.5 Final Report.

The TDWR Test Director will be responsible for preparing a Final Test report. A Draft report will be delivered to the Program Manager 30 days after the completion of OT&E Integration and OT&E Operational testing. The Final Test Report will document the results of detailed test analysis, and assess the compliance of each test to defined criteria. The status of problems identified previously in the Quick Look Test Reports will be updated, a revised assessment will be made of their impact on the tested system, and the suggested corrective actions required. Any new problems discovered by detailed evaluation will be identified and their impact in the system described.

The Final Test Report will contain the following:

a. Final Test Report title page.
b. Executive Summary.
c. Table of Contents.
d. Introduction.
e. Documents referenced.
f. System Description.
g. Test Description.
h. Results and Discussion.
i. Conclusions.
j. Recommendations.
k. Acronyms and Abbreviations.

5.5 SCHEDULES AND PERSONNEL REQUIREMENTS.

This section includes the overall schedule of TDWR Build 5A OT&E events and personnel requirements for OT&E Integration and OT&E Operational testing.

5.5.1 Test Schedule.

This section presents the schedules for TDWR OT&E Integration and OT&E Operational activities. TDWR OT&E activities are traceable and supportive of the TDWR TEMP.

This schedule indicates the TDWR OT&E Test Activity as shown in figure 5.5.1-1. The schedule is developed, released, and controlled by the Test Director, ACW-200. The function of this schedule is to provide direction to all TDWR activities. They identify the major tasks to be accomplished (e.g., Test Plan and Test Procedures complete) and identify task start and stop dates. This schedule enables the Test Director to provide detailed test status to the test groups.

5.5.2 Personnel Resource Requirements.

The personnel requirements for OT&E Integration and OT&E Operational test conduct are included in table 5.5.2-1.

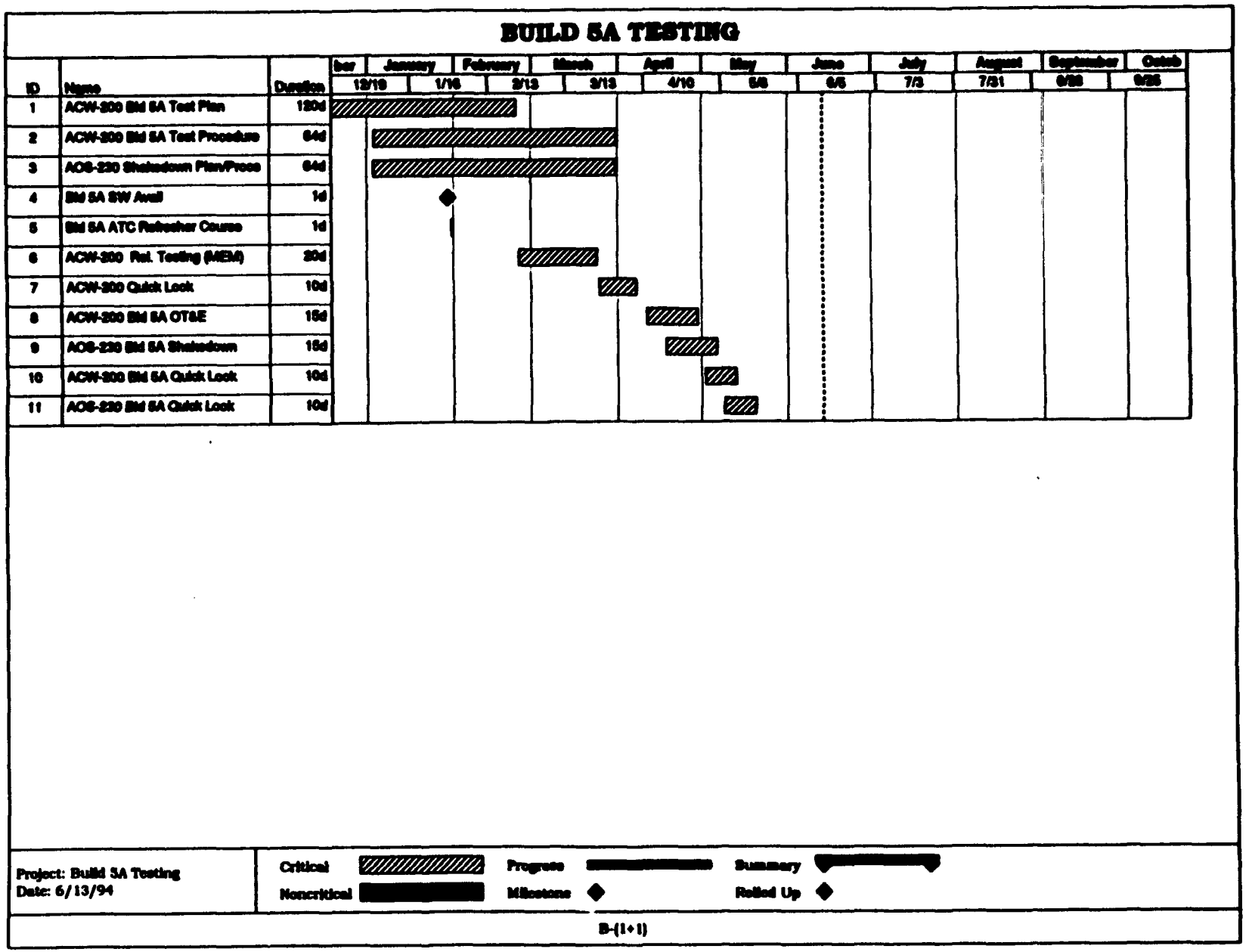

FIGURE 5.5.1-1. TDWR BUILD 5A OT&E TEST ACTIVITY

TABLE 5.5.2-1. TDWR OT&E INTEGRATION AND OT&E OPERATIONAL TEST SUPPORT PERSONNEL

Organization	No. Of People	Position
ACW-200D	1	Test Director
ACW-200D	1/1	Test Monitor/Operator
AF Field Personnel	1-2	Test Operator
AOS-230	1-2	Test Monitor/Operator
ATR-120	1	Test Monitor/Operator
ACN-100	2	Test Operator
ATQ-1	1	Test Witness
NSSL	1	Test Monitor
ANR-900	1	Test Witness

Note: Not all of these organizations will be present during every test. The test procedures will identify appropriate personnel.

6. ACRONYMS AND ABBREVIATIONS.

A	Analysis
ACN	Engineering, Test, and Evaluation Service, FAA Technical Center
ACW	Weather and Primary Radar Division, FAA Technical Center
AF	Airways Facilities
ANR	Program Director for Weather Radar
ANT	Antenna
APMT	Associate Program Manager for Test
AOS	Systems Maintenance Service, FAA Aeronautical Center
AT	Air Traffic
ATC	Air Traffic Control
ATR	Air Traffic Plans and Requirements Service
ATQ	Office of Independent Operational Test and Evaluation Oversight
BDD	Base Data Display
BDR	Base Data Recorder
bps	Bits per second
CFW	Center Field Wind
CMTP	Contractor's Master Test Plan
CMU	Concrete Masonry Unit
COTS	Commercial-Off-The-Shelf
CSCI	Computer Software Configuration Item
D	Demonstration
DFU	Display Functional Unit
DPL	Display Computer
DPO	Data Processing Operating System
DQT	Design Qualification Test
DSP	Digital Signal Processor
DT&E	Development Test and Evaluation
FAA	Federal Aviation Administration
FAAAC	Federal Aviation Administration Aeronautical Center
GSD	Geographical Situation Display
HWCI	Hardware Configuration Item
I	Inspection
IMCS	Interim Monitor and Control Software
LLWAS	Low Level Wind Shear Alert System
MDT	Maintenance Data Terminal
MEM	Terminal Doppler Weather Radar site in Memphis, TN
M&OS	Maintenance and Operations Support
MPS	Maintenance Processor Subsystem
MTBF	Mean Time Between Failure
MTBCF	Mean Time Between Critical Failure
MTS	Moving Target Simulator
NAS	National Airspace System
NSSL	National Severe Storms Laboratory
OT&E	Operational Test and Evaluation
PM	Program Manager
PSF	Program Support Facility
RDA	Radar Data Acquisition
RDT	Ribbon Display Terminal
REX	Receiver/Exciter
RMMS	Remote Maintenance Monitoring System

RMS	Remote Monitoring Subsystem
RPG	Radar Product Generator
SCU	Servo Control Unit
SDT	Software Development Tools
SFO	Sector Field Office
SPB	Site Program Bulletin
SPT	Special Test Equipment
SR	Service Report
T	Test
TCCC	Tower Control Computer Complex
TDWR	Terminal Doppler Weather Radar
T&E	Test and Evaluation
TEMP	Test and Evaluation Master Plan
TRACON	Terminal Radar Approach Control Facility
TTL	Test Tools Library
TVRTM	Test Verification Requirements Traceability Matrix
UNIX_UNX	Display System Operating System
VRTM	Verification Requirements Traceability Matrix
VTX	VRTX-32 Operating System
x	Not Applicable
XMT	Transmitter

APPENDIX A

TEST VERIFICATION REQUIREMENTS TRACEABILITY MATRIX (TVRTM)

Terminal Doppler Weather Radar
NAS-SS-1000 Volume I Test Verification Requirements Traceability Matrix

Reqt. ID#	NAS-SS-1000	Description/Title	Verification Level/Method		Remarks
			OT&E Integration	OT&E Operational	
1001	3.2.1.1.1.1	Air traffic control functional characteristics - Disseminate weather data	x	I	Build 5A and 5B
1002	3.2.1.1.4.1.B	Weather functional characteristics - Collect/Sense weather information	x	x	Verified during 1992 TFT&E
1003	3.2.1.1.4.1.D	Weather functional characteristics - Display weather information	x	T	Build 5A and 5B
1004	3.2.1.1.4.1.G	Weather functional characteristics - Classify weather information	x	T	Build 5A and 5B
1005	3.2.1.1.4.1.H	Weather functional characteristics - Alert specialists of hazardous weather	x	T	Build 5A and 5B
1006	3.2.1.1.4.1.I	Weather functional characteristics - Disseminate weather information	x	T	Build 5A and 5B
1007	3.2.1.1.4.1.K	Weather functional characteristics - Generate weather products	x	T	Build 5A and 5B
1008	3.2.1.1.4.1.N	Weather functional characteristics - Archive weather information	x	T	Build 5B
1009	3.2.1.1.8.1.3	Data and voice archiving	A	T	Build 5B
1010	3.2.1.1.9.1.A	Maintenance and Operations Support (M&OS) functional characteristics - Continually monitor subsystems	T	x	Deferred to ACN-100
1011	3.2.1.1.9.1.B	M&OS functional characteristics - Provide subsystem status/Generate alarm	T	x	Deferred to ACN-100

Verification Methods: T=Test, D=Demonstration, A=Analysis, I=Inspection, x=Not Applicable

Terminal Doppler Weather Radar
NAS-SS-1000 Volume I Test Verification Requirements Traceability Matrix

Reqt. ID#	NAS-SS-1000	Description/Title	Verification Level/Method		Remarks
			OT&E Integration	OT&E Operational	
1012	3.2.1.1.9.1.C	M&OS functional characteristics - Provide on-site, off-site control	T	x	Deferred to ACN-100
1013	3.2.1.1.9.1.D	M&OS functional characteristics - Identify malfunctioning LRU	T	x	Deferred to ACN-100
1014	3.2.1.1.9.1.E	M&OS functional characteristics - Retain maintenance data	T	x	Deferred to ACN-100
1015	3.2.1.1.9.1.F	M&OS functional characteristics - Information organization and processing	T	x	Deferred to ACN-100
1016	3.2.1.1.9.1.G	M&OS functional characteristics - Provide specialist access to subsystem	T	x	Deferred to ACN-100
1017	3.2.1.2.4.A.1	Weather performance characteristics - Detect surface weather conditions aloft	x	x	Verified during 1992 TFT&E
1018	3.2.1.2.4.A.2.B	Weather performance characteristics - Terminal	x	x	Verified during 1992 TFT&E
1019	3.2.1.2.4.B.1.A	Weather performance characteristics - Classify weather information as hazardous - terminal	x	T	Build 5A and 5B
1020	3.2.1.2.4.C.4.A	Weather performance characteristics - Hazardous weather information - terminal operations	x	T	Build 5A and 5B
1021	3.2.1.2.4.E.1	Weather performance characteristics - Derive weather products from raw data	x	T	Build 5A and 5B
1022	3.2.1.2.4.E.2	Weather performance characteristics - Weather processing using automated weather detection systems	x	T	Build 5A and 5B

Verification Methods: T=Test, D=Demonstration, A=Analysis, I=Inspection, x=Not Applicable

Terminal Doppler Weather Radar
NAS-SS-1000 Volume I Test Verification Requirements Traceability Matrix

Reqt. ID#	NAS-SS-1000	Description/Title	Verification Level/Method		Remarks
			OT&E Integration	OT&E Operational	
1023	3.2.1.2.4.F.2	Weather performance characteristics - Real-time depiction of weather conditions	x	T	Build 5A and 5B
1024	3.2.1.2.4.F.3	Weather performance characteristics - Wind shift warning	x	T	Build 5A and 5B
1025	3.2.1.2.4.F.4	Weather performance characteristics - Hazardous weather warning	x	T	Build 5A and 5B
1026	3.2.1.2.4.G	Weather performance characteristics - Archive all weather data	x	T	Build 5B
1027	3.2.1.2.8.4.B	NAS time standard performance characteristics - Provide synchronization of non-ATC processors	x	x	Verified during 1992 TFT&E
1028	3.2.1.2.8.4.C	NAS time standard performance characteristics - Provide interfaces to synchronization and coded time signal	x	x	Verified during 1992 TFT&E
1029	3.2.1.2.9.A	M&OS performance characteristics - Detect and present alarm to specialist	T	x	Deferred to ACN-100
1030	3.2.1.2.9.B	M&OS performance characteristics - Execution of control commands	T	x	Deferred to ACN-100
1031	3.2.1.2.9.C	M&OS performance characteristics - Develop and present requested data	T	x	Deferred to ACN-100
1032	3.2.1.2.9.D	M&OS performance characteristics - Acknowledge of commands	T	x	Deferred to ACN-100
1033	3.2.1.2.9.E	M&OS performance characteristics - Engineering field support subsystem	T	x	Deferred to ACN-100

Verification Methods: T=Test, D=Demonstration, A=Analysis, I=Inspection, x=Not Applicable

Terminal Doppler Weather Radar
NAS-SS-1000 Volume III Test Verification Requirements Traceability Matrix

Reqt. ID#	NAS-SS-1000	Description/Title	Verification Level/Method		Remarks
			OT&E Integration	OT&E Operational	
3001	3.2.1.2.5.1.1	Functional characteristics - Receive weather products from LLWAS	T	x	Build 5A and 5B
3002	3.2.1.2.5.1.2.A	Identify weather phenomena - Microburst	x	I	Build 5A and 5B
3003	3.2.1.2.5.1.2.B	Identify weather phenomena - Gust front	x	I	Build 5A and 5B
3004	3.2.1.2.5.1.2.C	Identify weather phenomena - Precipitation	x	I	Build 5A and 5B
3005	3.2.1.2.5.1.2.D	Identify weather phenomena - Storm motion	x	T	Build 5B
3006	3.2.1.2.5.1.3.A	Measure weather phenomena - Reflectivity	x	x	Verified during 1992 TFT&E
3007	3.2.1.2.5.1.3.B	Measure weather phenomena - Mean radial velocity	x	x	Verified during 1992 TFT&E
3008	3.2.1.2.5.1.3.C	Measure weather phenomena - Spectrum width	x	x	Verified during 1992 TFT&E
3009	3.2.1.2.5.1.4.A	Weather data processing - Type of weather	x	I	Build 5A and 5B
3010	3.2.1.2.5.1.4.B	Weather data processing - Location of weather	x	I	Build 5A and 5B
3011	3.2.1.2.5.1.4.C	Weather data processing - Velocity of weather	x	I	Build 5A and 5B
3012	3.2.1.2.5.1.4.D	Weather data processing - Severity of weather	x	I	Build 5A and 5B
3013	3.2.1.2.5.1.4.E	Weather data processing - Direction of storm motion	x	T	Build 5B
3014	3.2.1.2.5.1.5.A	Generate weather products - Microburst map	x	I	Build 5A and 5B
3015	3.2.1.2.5.1.5.B	Generate weather products - Microburst message/alarm	x	T	Build 5A and 5B

Verification Methods: T=Test, D=Demonstration, A=Analysis, I=Inspection, x=Not Applicable

Terminal Doppler Weather Radar
NAS-SS-1000 Volume III Test Verification Requirements Traceability Matrix

Reqt. ID#	NAS-SS-1000	Description/Title	Verification Level/Method		Remarks
			OT&E Integration	OT&E Operational	
3016	3.2.1.2.5.1.5.C	Generate weather products - Gust front map	x	I	Build 5A and 5B
3017	3.2.1.2.5.1.5.D	Generate weather products - Gust front message/alarm	x	T	Build 5A and 5B
3018	3.2.1.2.5.1.5.E	Generate weather products - Precipitation	x	I	Build 5A and 5B
3019	3.2.1.2.5.1.5.F	Generate weather products - Storm motion map	x	T	Build 5B
3020	3.2.1.2.5.1.5.1.A	LLWAS data integration - Receive	T	x	Build 5A and 5B
3021	3.2.1.2.5.1.5.1.B	LLWAS data integration - Generate	T	T	Build 5A and 5B
3022	3.2.1.2.5.1.5.1.C	LLWAS data integration - Validate	T	T	Build 5B
3023	3.2.1.2.5.1.5.1.D	LLWAS data integration - Merge	T	T	Build 5B
3024	3.2.1.2.5.1.5.1.E	LLWAS data integration - Transmit	T	T	Build 5A and 5B
3025	3.2.1.2.5.1.6	Generate alerts	x	I	Build 5A and 5B
3026	3.2.1.2.5.1.7	Disseminate weather data to TCCC	T	x	Build 5B
3027	3.2.1.2.5.1.8	Remote maintenance monitoring	T	x	Deferred to ACN-100
3028	3.2.1.2.5.1.9	Operational status	x	x	Verified during 1992 TFT&E
3029	3.2.1.2.5.1.10	Operational control	x	x	Verified during 1992 TFT&E
3030	3.2.1.2.5.1.11	Standard time reference	x	x	Verified during 1992 TFT&E
3031	3.2.1.2.5.1.12	Growth and flexibility	x	x	Verified during 1992 TFT&E
3032	3.2.1.2.5.2.1	Performance characteristics - Detection envelope	x	x	Verified during 1992 TFT&E

Verification Methods: T=Test, D=Demonstration, A=Analysis, I=Inspection, x=Not Applicable

Terminal Doppler Weather Radar
NAS-SS-1000 Volume III Test Verification Requirements Traceability Matrix

Reqt. ID#	NAS-SS-1000	Description/Title	Verification Level/Method		Remarks
			OT&E Integration	OT&E Operational	
3033	3.2.1.2.5.2.2.A	Resolution - Azimuth	x	x	Verified during 1992 TFT&E
3034	3.2.1.2.5.2.2.B	Resolution - Range	x	x	Verified during 1992 TFT&E
3035	3.2.1.2.5.2.2.C	Resolution - Elevation	x	x	Verified during 1992 TFT&E
3036	3.2.1.2.5.2.3.A	Accuracy - Azimuth	x	x	Verified during 1992 TFT&E
3037	3.2.1.2.5.2.3.B	Accuracy - Range	x	x	Verified during 1992 TFT&E
3038	3.2.1.2.5.2.3.C	Accuracy - Elevation	x	x	Verified during 1992 TFT&E
3039	3.2.1.2.5.2.4	System sensitivity	x	x	Verified during 1992 TFT&E
3040	3.2.1.2.5.2.5	Frequency	x	x	Verified during 1992 TFT&E
3041	3.2.1.2.5.2.6.A	Scanning strategies - 360 degrees	x	x	Verified during 1992 TFT&E
3042	3.2.1.2.5.2.6.B	Scanning strategies - Azimuth sector scans	x	x	Verified during 1992 TFT&E
3043	3.2.1.2.5.2.6.C	Scanning strategies - Range height indicator scan	x	x	Verified during 1992 TFT&E
3044	3.2.1.2.5.2.7	Archiving	T	T	Build 5B
3045	3.2.1.2.5.2.8	Alarm	x	x	Verified during 1992 TFT&E
3046	3.2.1.2.5.2.9	Update Rate	x	x	Verified during 1992 TFT&E
3047	3.2.1.2.5.2.9.1	Winds distribution	x	x	Verified during 1992 TFT&E
3048	3.2.1.2.5.2.10	Data destination	T	x	Build 5B
3049	3.2.1.2.5.2.11	Maintenance monitoring performance characteristics	T	x	Deferred to ACN-100

Verification Methods: T=Test, D=Demonstration, A=Analysis, I=Inspection, x=Not Applicable

Terminal Doppler Weather Radar
NAS-SS-1000 Volume III Test Verification Requirements Traceability Matrix

Requ. ID#	NAS-SS-1000	Description/Title	Verification Level/Method		Remarks
			OT&E Integration	OT&E Operational	
3050	3.2.1.2.5.2.12.A	Weather processing performance - Six level monitoring	x	x	Verified during 1992 TFT&E
3051	3.2.1.2.5.2.12.B	Weather processing performance - No data display	x	x	Verified during 1992 TFT&E
3052	3.2.1.2.5.2.12.C	Weather processing performance - Storm motion	x	T	Build 5B
3053	3.2.1.2.5.3.A	Functional/physical interfaces - LLWAS - TDWR	T	x	Build 5A and 5B
3054	3.2.1.2.5.3.B	Functional/physical interfaces - MDT - TDWR	I	x	Build 5A and 5B
3055	3.2.1.2.5.3.C	Functional/physical interfaces - TDWR - MDT	T	T	Integration: Deferred to ACN-100D Operational: Build 5A and 5B
3056	3.2.1.2.5.3.D	Functional/physical interfaces - MPS - TDWR	T	x	Deferred to ACN-100
3057	3.2.1.2.5.3.E	Functional/physical interfaces - TDWR-MPS	D	x	Deferred to ACN-100
3058	3.2.1.2.5.3.F	Functional/physical interfaces - TCCC-TDWR	T	x	Build 5B
3059	3.2.1.2.5.3.G	Functional/physical interfaces - TDWR-TCCC	T	x	Build 5B

Verification Methods: T=Test, D=Demonstration, A=Analysis, I=Inspection, x=Not Applicable